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AfriGEOSS
An Initiative to build GEOSS in Africa

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For information

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1 STRATEGIC CONTEXT

The AfriGEOSS initiative seeks to identify challenges and to put in place measures to enhance Africa's participation in, and contribution to, the Global Earth Observation System of Systems (GEOSS). This participation will support the continent's efforts to bridge the digital divide and to build a knowledge-based economy using the Group on Earth Observations (GEO) networks and emerging GEOSS infrastructure.

The GEO partnership currently includes 22 Member States and five Participating Organisations from Africa. As the number of African Members has increased in recent years, more needs to be done. It would also be useful to assess the progress made thus far in implementing and using GEOSS, as well as other Earth observation and environmental management initiatives in Africa. AfriGEOSS is dedicated to linking current GEO activities with existing capabilities and initiatives in Africa in order to enhance the region's capacity for producing, managing and using Earth observations.

The objectives of AfriGEOSS are as follows:

- To coordinate and bring together relevant stakeholders, institutions and agencies across Africa that are involved in GEO and other Earth observation activities;
- to provide a platform for countries to participate in GEO and to contribute to GEOSS;
- to assist in knowledge sharing and global collaboration;
- to identify challenges, gaps and opportunities for African contributions to GEO and GEOSS;
- to leverage existing capacities and planned assets and resources; and
- to develop an appropriate strategy and participatory model for achieving the above goals.

2 INITIAL ACTIONS

AfriGEOSS will establish the following initial actions:

2.1 Engage with appropriate regional agencies and training centres

Collaboration on establishing and/or strengthening regional capacity-building networks has already taken place through the GEO Capacity Building Committee (which as of January 2012 has been integrated into the Institutions and Development Board) and the Committee on Earth Observation Satellites (CEOS) Working Group on Capacity Building and Data Democracy. These mechanisms complement the ability of the GEOSS Common Infrastructure (GCI) to provide end users with access to data, information, products and services. The provision of education and training programmes focusing on the development of open-source software and open systems, and the development of acquisition and dissemination mechanisms, need to take into consideration the challenges of limited bandwidth in many developing countries.

The UN Economic Commission for Africa (UNECA), the Regional Centre for Monitoring of Resources for Development (RCMRD, Kenya), the African Association of Remote Sensing of the Environment (AARSE), and the Environmental Information System (EIS-Africa), each with extensive experience in geospatial activities, will assist by using their networks to ensure that effective and well coordinated education and training activities are established; they will also support the creation of networks amongst other relevant agencies.

There are also a number of existing regional training centres that will play significant roles in GEOSS regional coordination, such as the African Centre of Meteorological Information for Development (ACMAD, Niger), the Regional Centre for Training in Aerospace Surveys (RECTAS, Nigeria), the Regional Centre for Training and Application in Agrometeorology and Operational Hydrology (Centre Regional de Formation et d'Application en Agrométéorologie et Hydrologie Opérationnelle -- AGRHYMET, Niger), the African Regional Centre for Space Science and Technology Education (CSSTE, Morocco), the African Regional Centre for Space Science and Technology Education (CSSTE, Nigeria), Regional Science Service Centres: West African Science Service Center on Climate Change and Adapted Land Use (WASCAL) and Southern African Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL); and others. These institutions will use their existing regional networks, infrastructures and programmes to promote GEOSS in Africa, and GEO will provide additional visibility for each of these institutions to the global community.

2.2 Identify areas relevant for coordinated infrastructure pilot projects that focus on societal benefits.

Proposed areas for pilot projects incl udeground stations to support a coordinated data acquisition strategy for Africa, the African Resources and Environmental Management Constellation (ARMC), and Africa's future missions, among others.

- **Coordinated data acquisition strategy for Africa.** The ability to downlink data directly for processing will strongly support the development of timely downstream applications, products and services. This will substantially expand access to, and use and application of Earth observation data for policy- and decision-making. Such services will provide significant societal benefits, particularly in the areas of disasters (fires, floods), disease outbreaks and natural resources management. Several ground stations already exist, but because they are not interoperable their full potential for supporting research, applications and human capital development has not been realised. To remedy this situation, AfriGEOSS can provide a coordination mechanism for promoting interoperability involving interfaces, common file formats, common dissemination standards, etc. The first step will be to engage the ground stations in Kenya (Malindi), Egypt (NARSS), South Africa (SANSA), Nigeria (NARSDA), Gabon and Algeria (ASAL). Implementing this strategy will complement the data policy of the African Resources and Environmental Management Constellation (ARMC).
- **African Resources and Environmental Management Constellation (ARMC).** The ARM constellation initiative will provide Africa with timely, free, open and unrestricted access to medium to high resolution data over Africa for natural resources management applications. The countries currently involved (Algeria, Nigeria, Kenya and South Africa) are collaborating on sustaining and expanding indigenous human capital to support space programmes in Africa.
- **African Monitoring of the Environment for Sustainable Development (AMESD) and Monitoring of Environment and Security in Africa (MESA).** AMESD has improved access to Earth observation data, established operational information services and strengthened political and policy frameworks for environmental monitoring and sustainable management of natural resources. MESA is expected to be funded by the 10th European Development Fund (EDF) and will start this year. It will ensure that there is continuity in the work done at the conclusion of AMESD.

2.3 Identify areas relevant for coordinated pilot projects that focus on societal benefits

Proposed areas are agriculture and food security, forestry, renewable energy (biomass, solar), health, the GEOSS African Water Cycle Coordination Initiative, African Monitoring of Environment for Sustainable Development (AMESD), and the Global Forest Observation Initiative (GFOI), among others. For example:

- **Bio-Energy Atlas for Africa**. This project aims to develop a Bio-Energy Atlas for Africa to provide information on the quantity, distribution, uses and quality of biomass;
- **Global Forest Observations Initiative (GFOI).** An operational global network of national forest monitoring systems is needed, *inter alia*, in support of reducing greenhouse gas emissions from deforestation and forest degradation (REDD+). Three countries, namely Cameroon, Tanzania and Democratic Republic of Congo, are currently serving as "National Demonstrators". INPE's Capacity Building programme in Remote Sensing based Tropical Forest Monitoring will support this initiative;
- **The Meningitis Risk and Information Technology project (MERIT).** This collaborative effort of the World Health Organization (WHO) and members of the environmental, public health and epidemiological communities focuses on the Sub-Saharan region of Africa.

2.4 Promote data democracy and data sharing

GEO has been involved in the reconfiguration of the CEOS Working Group on Capacity Building and Data Democracy (WGCapD), which will be fully aligned with the Institutions and Development part of the GEO 2012-2015 Work Plan. The intention is to engage African agencies in implementing GEO's Data Democracy and Data Sharing tasks. These tasks will improve access to data by strengthening the understanding of individuals and institutions of technology limitations, proper dissemination methods and relevant software tools. This will also emphasize the development of open-source software and open systems. They will encourage academic institutions to collaborate, and they will also support education and training for the China Brazil Earth Resources Satellites (CBERS) programme, GEONetCast and SERVIR-Africa, amongst others. NOAA through the WGCapD and in coordination with RCMRD and SERVIR is working to distribute SRTM 2 data in Africa.

2.5 Organize sessions on GEO and GEOSS at premier African conferences

Relevant events for promoting GEO and GEOSS include those organized by the African Association of Remote Sensing for the Environment (AARSE), AfricaGIS and other forums. Current plans include holding a side event on AfriGEOSS and a Plenary presentation at AARSE 2012 in El Jadida, Morocco. The focus will be on encouraging African countries to become GEO Members and to actively participate in GEO tasks.

2.6 Organize regional workshops

The workshops will focus on coordinating and strengthening existing regional capacities. The aim is to provide support for regional agencies to conduct workshops in each of the African regions that will identify priority societal benefit areas for that region, as well as how regional coordination can be enhanced to ensure active participation in implementing GEOSS and building AfriGEOSS.

The following actions for regional agencies have been identified:

- The RCMRD will host a workshop that will focus on the development and implementation of the BioEnergy Atlas for Africa and the pilot project on Agriculture;
- The Ghana Space Science and Technology Centre together with the Nigerian National Research and Development Agency (NARSDA) will host the workshop in Accra for the **western region of Africa**;

- The National Authority for Remote Sensing and Space Sciences (NARSS) Environment Department, in consultation with the Moroccan Meteorological Agency, will host theworkshop for the **northern region of Africa**;
- South African GEO, in consultation with the Department of Science and Technology (DST), will host the **Southern African** Development Community (SADC) workshop; this can also include Madagascar, Mauritius and others;
- Engagements with the **Central African region** agencies such as the Gabonese Agency for the Study and Observation of Space (Agence Gabonaise d'Etude et d'Observation Spatiale – AGEOS) and GIS Centre of Rwanda are ongoing.

These two-day workshops are planned to be held in the late 2012 – early 2013 period. The focus will be on existing regional activities and priorities, discussions on the GEO Work Plan and GEOSS, and the identification of areas for coordination via pilot projects.

3 PROGRESS TO DATE AND NEXT STEPS

GEO has taken the following steps over the past year to launch work on AfriGEOSS:

- GEO has already made good progress in engaging with RCMRD, which will provide the springboard for launching this initiative. RCMRD will coordinate the participation of its 21 members for the implementation of pilot projects or showcases on data acquisition, agriculture, food security and other priority areas;
- The development of a BioEnergy Atlas for Africa has been included in the new GEO 2012-2015 Work Plan. The next step is to raise the necessary resources (South Africa has provided ZAR2 million in initial funding). Engagements with the International Renewable Energy Agency (IRENA) on collaboration and possible funding are underway; discussions with the German Space Agency (DLR), the National Renewable Energy Laboratory (NREL) and the Brazilian National Institute for Space Research (INPE) are also underway. This initiative is also supported by Z_GIS (Austria) through the FP7 Project EnerGEO;
- A coordinated data acquisition strategy (creating a "virtual network" of ground stations): The GEO Secretariat has launched this process by requesting a meeting with the Gabonese Agency for the Study and Observation of Space (AGEOS) to discuss the planned ground station and by visiting Kenya in late 2011 to explore how the Malindi ground station can be used further. The GEO Secretariat Director met with the Gabonese President and the Director General of AGEOS in September 2011 to discuss the development of the ground station. The Secretariat has also worked to further engage space agencies, namely, the South African National Space Agency (SANSA), the Algerian Space Agency (ASAL), NARSDA, and NARSS, at the September 2011 African Space Leadership Conference and the November 2011 International Astronautical Conference. Building on these initial steps, GEO will promote the establishment of a continent-wide collaborative mechanism to build the AfriGEOSS Coordinated Ground Network;
- The Secretariat contributed to the organization of the 3rd Crop and Rangeland Monitoring Workshop (CRAM), which was held in September 2011 in Nairobi , Kenya; EUMETSAT User Conference, October 2012, Addis Ababa, Ethiopia; and BRAGMA, October 2012, Mombasa, Kenya;
- The Secretariat supported the organization of the 3rd GEOSS African Water Cycle Symposium in February 2012 in Gabon as well as the participation of African experts. This followed the Secretariat's support to the 2nd GEOSS African Water Cycle Symposium convened at the United Nations Conference Centre in Addis Ababa, Ethiopia, on 23-25 February 2011, which aimed to develop a plan for an "African Water Cycle Coordination

Initiative, and the GEO-UNESCO Joint Workshop on Earth Observations and Capacity Development for IWRM for River Basins in Africa, which was held at UNESCO on 12-14 January 2012 in Nairobi, Kenya. This will be linked to the TIGER initiative, which focuses on the use of space technology for water resource management in Africa. It is aimed at assisting African countries to exploit the advantages of Earth observation technology and build independent African capacity whilst setting up sustainable water observation systems;

- The GFOI, comprising the GEO Forest Carbon Tracking (FCT) task includes a total of eleven countries that are acting as "National Demonstrators," three of which are African: Cameroon, Democratic Republic of Congo and Tanzania. The concept of National Demonstrators (ND's) was introduced in the GEO FCT task from the beginning as a way of defining the reference demonstration areas for developing and testing approaches and methodologies for monitoring forests, tracking carbon and addressing the REDD+ scheme being negotiated within the UNFCCC. The annual review of the GEO FCT activities was performed from 6-10 February 2012 in Arusha, Tanzania. This meeting offered an opportunity for African countries other than the three National Demonstrators to be exposed to GEO initiatives, including the support that GFOI is planning to provide in the near future. Representatives from eight African countries attended this meeting;
- Australia has recently launched an International Centre for Food Security that will be led by the Australian Centre for International Agricultural Research (ACIAR). The centre will be based in Canberra and will have an office in Africa. It will address under-investment in agriculture and focus on supporting emerging farmers. The centre will provide farmers, government agencies and the private sector with access to the research and technical expertise of a large network of Australian, African and international research bodies. A scoping meeting between representatives of the GEO Agriculture community and ACIAR was held on 13-17 February 2012 in Canberra, following a workshop on crop monitoring and yield forecasting, which is aligned with GEOGLAM objectives. The meeting focused on the process of understanding how to optimise the development of capacity in Africa;
- Since 2009, GEO has worked in partnership with the International Charter for Space and Major Disasters to improve access to space based data for major disasters in Africa. The Charter is a worldwide collaboration among 13 space agencies, with the aim of making satellite data rapidly available at no cost to disaster management authorities, during the response phase of an emergency. A recent Charter decision will allow national disaster management authorities world-wide, provided they meet certain criteria, to submit requests for emergency response. The Charter is preparing a set of actions to appropriately communicate with African national users, using the GEO network to facilitate this process;
- The European Space Agency's (ESA) TIGER initiative, launched by ESA in 2002 in the context of CEOS, supports African water authorities, technical centers and research institutions by enhancing their capacity to collect and use water-relevant geo-information to better monitor, assess and inventory water resources using Earth observation products and services. Over the last 10 years TIGER has conducted numerous capacity building and development activities, including training courses, international workshops, research projects, and Earth observation data dissemination and demonstration activities in order to support the basis for an independent African capacity in Integrated Water Resource Management (IWRM). The latest activity, called TIGER-NET, is developing and implementing Water Observation Information Systems based on open-source software with the responsible water authorities of five major trans-boundary river basins in Africa in preparation for the operational observations of the upcoming Sentinel missions.

African governments and organizations should now consider taking action to supplement the initial funding from South Africa. Active participation in GEO activities will expose African experts to

global collaborations and improve their access to data and open-software tools for applications development. This will generate huge benefits to society, help to sustain existing capabilities, bring in new knowledge and, most importantly, provide a large return on investment and build capacity.

4 ACKNOWLEDGEMENTS

We wish to express our indebted appreciation and recognition to the Member States and Participating Organizations for their support and contributions to GEO initiatives in Africa. Our sincere gratitude to:

- South Africa for the seed funding and continuous support for GEO initiatives in Africa;
- The European Commission for funding various Earth observation projects in Africa, such as AMESD (MESA), EnerGEO, DevCoCast, and GEONETCAB (or GEONETCast?), amongst others;
- Brazil and China for CBERS data dissemination and ground stations support in Africa;
- Japan and UNESCO for supporting the African Water Cycle Initiative;
- Norway, Australia, and the United States for supporting GFOI and National Demonstratorss in Africa; and
- And again, All Member States and Participating Organizations that have contributed to GEO and GEOSS activities in Africa.

Annex

BACKGROUND INFORMATION: AFRICA IN GEO

As of October 2012, the GEO membership included 88 countries plus the European Commission. The 22 members from Africa are: Algeria, Burkina Faso, Cameroon, Central African Republic, Republic of the Congo, Egypt, Ethiopia, Gabon, Ghana, Guinea-Bissau, Republic of Guinea, Ivory Coast, Madagascar, Mali, Mauritius, Morocco, Niger, Nigeria, South Africa, Sudan, Tunisia, and Uganda.

Five of GEO's 64 Participating Organisations are based in Africa: the African Association of Remote Sensing for the Environment (AARSE), the African Centre for Climate Monitoring and Applications Development (ACMAD), Environmental Information System (EIS-Africa), United Nations Economic Commission for Africa (UNECA) and the Regional Centre for Monitoring and Remote Sensing Development (RCMRD).

Three of the GEOSS Strategic Targets are particularly relevant to the AfriGEOSS initiative:

- Capacity building: Enhance the coordination of efforts to strengthen individual, institutional and infrastructure capacities, particularly in developing countries, to produce and use Earth observations and derived information products.
- Architecture: Achieve sustained operation, continuity and interoperability of existing and new systems that provide essential environmental observations and information, including the GEOSS Common Infrastructure (GCI) that facilitates access to, and use of, these observations and information.
- Data Management: Provide a shared, easily accessible, timely, sustained stream of comprehensive data of documented quality, as well as metadata and information products, for informed decision-making.